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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/692,666	SHEN ET AL.
	Examiner	Art Unit
	Mia M. Thomas	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 January 2008.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-8,10-13,15-18 and 20 is/are rejected.

7)☐ Claim(s) 9,14 and 19 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 January 2008 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to applicant's remarks received on 22 January 2008. Claims 1 to 10 were pending when last examined. Applicant has amended claims 4, 10, 15, 16, 18 and 20. Claims 1 to 20 remain pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-5, 16 and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (US 7,215,812 B1) in combination with Pollard (US 2004/0028271 A1) and Pavlidis (US 7,149,325 B2).

Regarding Claim 1: Masaki discloses a method for color matching a first image and a second image, wherein a first region of the first image and a second region of the second image overlap ("An image processing method for carrying out predetermined correction processing with respect to one or more items regarding the quality of color images..."at abstract), the method comprising:

generating a first histogram of the first region (Refer to Figure 5);

generating a second histogram of the second region (Refer to Figure 5);

determining corresponding pixel values from the first and the second histograms (Refer to Figure 4, numeral #51);

Pollard teaches determining at least one parameter of an optoelectronic conversion function (OECF) that best matches the corresponding pixel values ("The processing itself may be performed according to the steps outlined in the flow-chart of FIG. 7. These include a pre-processing stage 92, which may typically include correction of the OECF (opto-electronic conversion function) of the sensor and white-balancing to compensate for variations in illumination." at paragraph [0108])

and color matching the second image to the first image by applying the OECF with the at least one parameter to the second image ("Following the colour correction and de-mosaicing stage 94 described above, a subsequent post-processing stage 96 may include exposure correction (which can also be accomplished at the preprocessing stage) and transformation to a standard colour space such as RGB (as described in IEC 61966-2-1)." at paragraph [0108]).

By way of example, Pavlidis teaches a method for color matching a first image and a second image, wherein a first region of the first image and a second region of the second image overlap (Refer to Figures 16a-16d). The Examiner is stating that Figure 16a is a first image and Figure 16b is a second image. For clarity, Figure 16a is an image of a house where "the man" is not present, whole Figure 16b is another image where "the man" is present in front of the house. Figures 16c - 16d show where the features of the images overlap, specifically with reference to

Figure 16b and 16d. For clarity, "the man" and the lower window section (area where "the man" is standing in front of) overlap.

Pavlidis teaches generating a first histogram of the first region (Refer to Figure 17a-17b); generating a second histogram of the second region (Refer to Figure 17a-17b); Further at column 26, line 25. For clarity, the Examiner is stating that in the statement "There may be similar histograms for the colors green and blue of image 322. Since there are a three color regions associated with image 322, there are multiple histograms that can be created as demonstrated in Figure 17a.

determining corresponding pixel values from the first and the second histograms (Refer to column 26, line 25-36).

Masaki, Pollard and Pavlidis are combinable because they are in the same field of color image processing, specifically, color correction. (See title and abstract of each invention).

All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as disclosed/taught by Maskai, Pollard and Pavlidis by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

All of the components as discloses/taught by Masaki could have been easily combined with both the teachings of Pollard and Pavlidis and yielded predictable results such as the specified claimed elements as claimed in claim 1. Therefore, at the time of the invention, the skilled

artisan could have combined all the claimed elements as disclosed/taught by Masaki, Pollard and Pavlidis and obtained all the claimed elements of Claim 1.

Regarding Claim 2: Masaki discloses prior to said generating a first histogram and generating a second histogram: removing a percentage of the overlapping pixels with the greatest difference in brightness (By way of example, refer to Figure 4, numeral #45).

Regarding Claim 3: Masaki discloses said generating a first histogram comprises recording in a first plurality of pixel value bins a first plurality of numbers of pixels that have respective pixel values in the first region (Refer to Figures #41 and #43); and said generating a second histogram comprises recording in a second plurality of pixel value bins a second plurality of numbers of pixels that have the respective pixel values in the second region (Refer to Figures #49 and #51).

Regarding Claim 4: Masaki discloses determining corresponding pixel values in the first and the second histograms comprises generating a lookup table (LUT) storing a third plurality of numbers of pixels and their corresponding pixel values (Refer to Figure 1, numeral 202, further refer to column 4, line 22).

Regarding Claim 5: Masaki discloses generating a lookup table comprises:

(1) initializing all entries in the LUT to 0;

(2) initializing a first loop by setting $i = 0$; $j = 0$; $rem1 = h1[0]$; and $rem2 = h2[0]$;

(3) updating the LUT by setting $min\_rem = \min(rem1, rem2)$; $rem1 = rem1 - min\_rem$; and $rem2 = rem2 - min\_rem$; and incrementing $LUT[i][j]$ by min_rem;

(4) if $rem1 = 0$, then incrementing i and setting $rem1 = h1[i]$;

(5) if $rem2 = 0$, then incrementing j and setting $rem2 = h2[j]$;

(6) if $i < 256$ and $j < 256$, then repeating steps (3) to (5);

wherein h1[ ] is the number of pixels having a certain pixel value in the first histogram, h2[ ] is the number of pixels having a certain pixel value in the second histogram, and LUT[ ][ ] is the number of pairs of corresponding pixel values having a certain pixel value in the first histogram and a certain pixel value in the second histogram (Refer to Figure 1, numeral 203).

Regarding Claim 16: Masaki discloses a method for color matching a first image and a second image, wherein a first region of the first image and a second region of the second image overlap ("An image processing method for carrying out predetermined correction processing with respect to one or more items regarding the quality of color images…"at abstract), the method comprising: removing a percentage of overlapping pixels with the greatest difference in brightness (Refer to Figure 4, numeral #45); generating a first histogram of the first region and a second histogram of the second region after said removing (Refer to Figure 5); histogram matching the first and the second histogram to determine corresponding pixel values from the

first and the second histograms (Refer to Figure 4, numeral #43-#47); minimizing a color matching error between the corresponding pixel values, wherein the color matching error is generated from an optoelectronic conversion function (OECF) (Refer to Figure 4, numeral #41); and color matching the second image to the first image by applying the OECF to the second image (Refer to Figure 4, numerals #53-#59).

Referring to Claim 17: Masaki discloses the method of claim 16, wherein said histogram matching the first and the second histograms comprises generating a lookup table (LUT) as follows: (1) initializing all entries in the LUT to 0;

(2) initializing a first loop by setting $i = 0$; $j = 0$; $rem1 = h1[0]$; and $rem2 = h2[0]$;

(3) updating the LUT by setting $min\_rem = \min(rem1, rem2)$; $rem1 = rem1 - min\_rem$; and $rem2 = rem2 - min\_rem$; and incrementing $LUT[i][j]$ by min_rem;

(4) if $rem1 = 0$, then incrementing i and setting $rem1 = h1[i]$;

(5) if $rem2 = 0$, then incrementing j and setting $rem2 = h2[j]$;

(6) if $i < 256$ and $j < 256$, then repeating steps (3) to (5);

wherein h1[ ] is the number of pixels having a certain pixel value in the first histogram, h2[ ] is the number of pixels having a certain pixel value in the second histogram, and LUT[ ][ ] is the number of pairs of corresponding pixel values having a certain pixel value in the first histogram and a certain pixel value in the second histogram (Refer to Figure 1, numeral 203).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 6-7, 10-13, 15, 18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (US 7,215,812 B1) in combination with Pollard (US 2004/0028271 A1) and Pavlidis (US 7,149,325 B2), further in view of Hasler "Modeling the Opto-Electronic Conversion Function (OECF) For Application in the Stitching of Panoramic Images, hereinafter referred to as Hasler-(MOASPI).

Regarding Claim 6:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose said determining at least one parameter of an OECF comprises minimizing a color matching error, the color matching error being defined as:

$$e = \sum_{i=0}^{255}\sum_{j=0}^{255} LUT[i][j]((i+1)/256.0 - S^{-1}(\tau S((j+1)/256.0))),$$

wherein e is the color matching error, r is a color matching parameter, and S( ) is the OECF

Hasler – (MOASPI) teaches determining at least one parameter of an OECF comprises minimizing a color matching error, the color matching error being defined as:

$$e = \sum_{i=0}^{255}\sum_{j=0}^{255} LUT[i][j]((i+1)/256.0 - S^{-1}(\tau S((j+1)/256.0))),$$

wherein e is the color matching error, r is a color matching parameter, and S( ) is the OECF (Refer to Equation 2b, right column, section 4, "The Error Metric").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the teachings of Masaki, Pollard and Pavlidis with the teachings as taught by Hasler, specifically at Equation 2b, to define the color matching error to be the determination and defining elements of the OECF to determine a parameter for application

The suggestion/motivation for combining all these claimed elements would be because these function "creates parameters that account for the difference in exposure of the two pictures" as disclosed in the claimed invention.

Therefore, at the time of the invention, the skilled artisan could have combined the teachings/disclosure of the combination of Masaki, Pollard and Pavlidis with the teachings of Hasler to obtain the specified claimed elements of claim 6.

Therefore, at the time that the invention was made, it would have been obvious to one

claimed elements of Claim 6.

Regarding Claim 7:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose the OECF is defined as: $S(x) = x + \frac{2}{\pi}arctan\left(\frac{a\,sin(\pi x)}{1 - a\,cos(\pi x)}\right)$, wherein x is a pixel value normalized to (0,1), and a epsilon.(-1,1) is another color matching parameter.

Hasler– (MOASPI) teaches the method of claim 6, wherein the OECF is defined as: $S(x) = x + \frac{2}{\pi}arctan\left(\frac{a\,sin(\pi x)}{1 - a\,cos(\pi x)}\right)$, wherein x is a pixel value normalized to (0,1), and a epsilon.(-1,1) is another color matching parameter (Refer to Equation 1, right column, section 3, "The OECF Model").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to define the OECF as taught by Hasler.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because these teachings create a function which “creates parameters that account for the difference in exposure of the two pictures” as disclosed in the claimed invention.

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 7.

Regarding Claim 10:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose applying the optoelectronic conversion function comprises: $x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value in the second image, S.sup.-1( ) is the inverse of the OECF, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1-\tau)x_i$.

Hasler- (MOASPI) teaches applying the optoelectronic conversion function comprises: $x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value in the second image, S.sup.-1( ) is the inverse of the OECF, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1 - \tau)x_i$. (Refer to Equation 4, left column, section 5, "The Complete Model").

to the application of the OECF as disclosed by Masaki because

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to apply the inverse of the OECF as taught by Hasler.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because "it will avoid the degenerate solution and is convenient to approximate." (Hasler, page 2, paragraph 3).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 10.

Regarding Claim 11:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose the OECF is defined as:

$$S(x) = x + \frac{2}{\pi} \arctan\left(\frac{a \sin(\pi x)}{1 - a \cos(\pi x)}\right),$$

wherein S ( ) is the OECF, x is a pixel value normalized to (0, 1), and a(epsilon)(-1,1) is a first color matching parameter

Hasler-- (MOASPI) teaches the OECF is defined as:

$$S(x) = x + \frac{2}{\pi} arctan\left(\frac{a\,sin(\pi x)}{1 - a\,cos(\pi x)}\right),$$

wherein S( ) is the OECF, x is a pixel value normalized to (0,1), and a(epsilon)(-1,1) is a first color matching parameter (Refer to Equation 1, right column, section 3, "The OECF Model").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to define the OECF is defined as:

$$S(x) = x + \frac{2}{\pi} arctan\left(\frac{a\,sin(\pi x)}{1 - a\,cos(\pi x)}\right),$$

wherein S( ) is the OECF, x is a pixel value normalized to (0,1), and a(epsilon)(-1,1) is a first color matching parameter.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because the OECF with these definitive elements can "deliver an optimal result in a least square error sense." (Hasler, abstract)

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 11.

Regarding Claim 12:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose determining at least one parameter of

an OECF comprises minimizing a color matching error defined as:

$$e = \sum_{x_1 \in \Re_1, x_2 \in \Re_2} \left\| x_1 - S^{-1}(\tau S(x_2)) \right\|^2,$$

wherein e is the color matching error, x.sub.1 and x.sub.2 are corresponding pixel values in the first and the second regions, R.sub.1 and R.sub.2 are the first and the second regions, S( ) is the OECF, S( ).sup.-1 is the inverse OECF, and (tau) is a second color matching parameter.

Hasler-- (MOASPI) teaches determining at least one parameter of
an OECF comprises minimizing a color matching error defined as:

$$e = \sum_{x_1 \in \Re_1, x_2 \in \Re_2} \left\| x_1 - S^{-1}(\tau S(x_2)) \right\|^2,$$

wherein e is the color matching error, x.sub.1 and x.sub.2 are corresponding pixel values in the first and the second regions, R.sub.1 and R.sub.2 are the first and the second regions, S( ) is the OECF, S( ).sup.-1 is the inverse OECF, and (tau) is a second color matching parameter (Refer to Equation 2d, left column, paragraph 2, section 4 “The Error Metric”).

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to determining at least one parameter of
an OECF comprises minimizing a color matching error defined as:

$$e = \sum_{x_1 \in \Re_1, x_2 \in \Re_2} \left\| x_1 - S^{-1}(\tau S(x_2)) \right\|^2 ,$$

wherein e is the color matching error, x.sub.1 and x.sub.2 are corresponding pixel values in the first and the second regions, R.sub.1 and R.sub.2 are the first and the second regions, S( ) is the OECF, S( ).sup.-1 is the inverse OECF, and (tau) is a second color matching parameter.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because this color matching error as "defined applies to the region of the histogram that contains most of the data still delivering a small error." (Hasler, page 2, right column, 2nd paragraph).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 12.

Regarding Claim 13:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose minimizing a color matching error comprises performing a golden section search of the color matching error.

Hasler– (MOASPI) teaches minimizing a color matching error comprises performing a golden section search of the color matching error (For example, refer to equations (10.1.6) and (10.1.7) in reference to the golden mean or golden section search examples).

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to minimizing a color matching error comprises performing a golden section search of the color matching error.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because "the golden section search guarantees that each new function evaluation will bracket minimum to an interval a precise number times the size of the preceding interval." (Press, page 399-400, last paragraph, final sentence).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 13.

Regarding Claim 15:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose applying the OECF comprises: $x_c = S^{-1}(W(r,x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value in the

second image, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1-\tau)x_i$.

Hasler– (MOASPI) teaches applying the OECF comprises: $x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original

pixel value in the second image, x(c) is a corrected pixel value in the

second image, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1-\tau)x_i$. (Refer to Equation 4, left column, section 5, "The Complete Model").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to apply the OECF comprises: $x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value in the second image, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1 - \tau)x_i$.

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because with the application of Equation 4(Hasler), applies the gains to adjust the white points and reapply the OECF." (Hasler, page 2, section 5, paragraph 2).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 15.

Regarding Claim 18:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose determining parameters of the OECF comprises minimizing a color matching error, the color matching error being defined as:

$$e = \sum_{i=0}^{255}\sum_{j=0}^{255} LUT[i][j]((i+1)/256.0 - S^{-1}(\tau S((j+1)/256.0))),$$

wherein e is the color matching error, (tau) is a color matching parameter and S(x) is the OECF defined as:

$$S(x) = x + \frac{2}{\pi}\arctan\left(\frac{a\sin(\pi x)}{1 - a\cos(\pi x)}\right),$$

wherein S(x) is the OECF, x is a pixel value normalized to (0,1), and a(epsilon)(-1,1) is another color matching parameter.

Hasler – (MOASPI) teaches determining parameters of the OECF comprises minimizing a color matching error, the color matching error being defined as:

$$e = \sum_{i=0}^{255}\sum_{j=0}^{255} LUT[i][j]((i+1)/256.0 - S^{-1}(\tau S((j+1)/256.0))),$$

wherein e is the color matching error, .tau. is a color matching parameter (Refer to Equation 2b, right column, section 4, "The Error Metric"); and S(x) is the OECF defined as:

$$S(x) = x + \frac{2}{\pi}\arctan\left(\frac{a\sin(\pi x)}{1 - a\cos(\pi x)}\right),$$

wherein S(x) is the OECF, x is a pixel value normalized to (0,1), and a (epsilon)(-1,1) is another color matching parameter (Refer to Equation 1, right column, section 3, "The OECF Model").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to further define the OECF function as disclosed by Masaki, with reference to Equation 1, right column, section 3, "The OECF Model" as taught by Hasler because "the OECF with these definitive elements can "deliver an optimal result in a least square error sense." (Hasler, abstract).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 18.

Regarding Claim 20:

Masaki in combination with Pollard and Pavlidis discloses/teaches all the claimed elements as listed above.

The combination of Masaki, Pollard and Pavlidis does not specifically disclose applying the optoelectronic conversion function comprising:

$x_c = S^{-1}(W(\tau,x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c)is a corrected pixel value of the second image, and W is a weight function defined

as: $W(\tau,x_i) = \tau + (1-\tau)x_i$.

Hasler- (MOASPI) teaches applying the optoelectronic conversion function comprises:

$x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value of the second image, and W is a weight function defined as: $W(\tau, x_i) = \tau + (1-\tau)x_i$, (Refer to Equation 4, left column, section 5, "The Complete Model").

Masaki, Pollard, Pavlidis and Hasler are combinable because they are in the same field of image segmenting in panoramic images and opto-electronic conversion functionality. (See title and abstract of each invention).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to applying the optoelectronic conversion function comprises:

$x_c = S^{-1}(W(\tau, x_o)S(x_o))$, wherein x(o) is an original pixel value in the second image, x(c) is a corrected pixel value of the second image, and W is a weight function defined

as: $W(\tau, x_i) = \tau + (1 - \tau)x_i$,

The suggestion/motivation to combine the teachings/disclosure of Masaki, Pollard and Pavlidis with Hasler would be because " this application performs the balancing by using the weight factor and adjusts the white point and reapplies the OECF." (Hasler, Page 2, section 5, paragraph 2).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard and Pavlidis with Hasler to obtain the specified claimed elements of Claim 20.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (US 7,215,812 B1) in combination with Pollard (US 2004/0028271 A1) and Pavlidis (US 7,149,325 B2), further in view of Hasler "Modeling the Opto-Electronic Conversion Function (OECF) For Application in the Stitching of Panoramic Images, hereinafter referred to as Hasler- (MOASPI)

and Press, "The Art of Scientific Computing, 10.1 Golden Search in One Dimension"-hereinafter referred to as Press.

Regarding Claim 8: Masaki in combination with Pollard, Pavlidis and Hasler discloses/teaches all the claimed elements as listed above.

The combination of Masaki and Hasler does not specifically disclose wherein said minimizing a color matching error comprises performing a golden section search of the color matching error.

Press teaches minimizing a color matching error comprises performing a golden section search of the color matching error (For example, refer to equations (10.1.6) and (10.1.7) in reference to the golden mean or golden section search examples).

Masaki, Pollard, Pavlidis, Hasler and Press are combinable because they are in the same field of color correction with specific reference to a search (see page 397, paragraph 1, Press).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to perform a golden section search of the color matching error as illustrated through examples from Press.

The suggestion/motivation to combine all the claimed elements as rejected above would be because "the golden section search guarantees that each new function evaluation will bracket

minimum values to an interval at a precise number times the size of the preceding interval." (Press, page 399-400, last paragraph, final sentence).

Therefore, at the time of the invention, it would have been obvious to the skilled artisan to combine Masaki, Pollard, Pavlidis, Hasler and Press to obtain the specified claimed elements of Claim 8.

Allowable Subject Matter

9. Claims 9, 14 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

1. Applicant's arguments, see page 10, filed, with respect to 22 Jan 2008 have been fully considered and are persuasive. The objection of color drawings (1.83(a)) has been withdrawn.

Examiner's Response: A petition decision under 37 CFR 1.84 (a) (2) filed 24 October 2003 has been granted as of 25 April 2008.

2. Applicant's arguments with respect to claims 1, 5, 16 and 17 at page 10 under 102(e) as being unpatentable have been considered but are moot in view of the new ground(s) of rejection.

3. Applicant's arguments with respect to claims 6-8, 10-13, 15, 18 and 20 at page 12 under 103(a) as being unpatentable have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mia M. Thomas whose telephone number is (571)270-1583. The examiner can normally be reached on Monday-Thursday 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkrami was Bali can be reached on 571-272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mia M Thomas/

Examiner, Art Unit 2624

/Vikkram Bali/

Supervisory Patent Examiner, Art Unit 2624